

REMARKS/ARGUMENTS

In the Office Action, the Examiner rejected claims 1-3, 5-7, 15-17, 19-22, 25, 26, and 29-34 under 35 U.S.C. 103(a) as being unpatentable over some combination of *Frankeny* et al. (US Pat. 5,691,041), *Ohshima* et al. (US Pat. 5,936,843), *Wang* et al. (US Pat. 6,081,026), *Akagawa* et al. (US Pat. 5,834,844), and *Mizuno* et al. (US Pat. 6,077,757). The rejections are fully traversed below. Reconsideration of the application is respectfully requested based on the following remarks.

Claims 1 and 15 have been amended. Support for the amendments may be found in the Specification on page 10, lines 14-16, page 14, line 27, and elsewhere. Accordingly, claims 1-3, 5-7, 15-17, 19-22, 25, 26, and 29-34 remain pending in this application.

REJECTION OF CLAIMS UNDER 35 U.S.C. §103(a)

The invention as set forth in independent claim 1 generally relates to an integrated circuit package. Specifically, independent claim 1 requires among other things “a single-layer solid flexible dielectric circuit film having a top surface, a bottom surface,” a routing conductor, and “at least one outer landing formed on the top surface and at least one inner landing formed on the bottom surface” where the “two landings are connected via the routing conductor, which extends laterally within the single-layer solid flexible dielectric circuit film”. Likewise, independent claim 15 requires a similar limitation as noted for claim 1 above.

One of the many advantages of having this single-layer solid flexible dielectric circuit film (FDCF) in the manner claimed is that it provides a highly compliant interconnection between the die and another substrate. Generally, in reference to FIGS. 4 and 5, the combination of the offset contact structure on the solid FDCF and the air gap (e.g., 414; 514) formed between the die and the FDCF absorbs stresses by allowing the contact bumps (e.g., 422; 522) on the FDCF to move inward into the air gap without damaging the die. In this way, the flexing of the FDCF into the air gap decouples some stresses that might otherwise be transferred in a rigid underfill layer or semi-rigid interposer layer located between the contact bumps and the die. (See page 10, lines 22-29) The implementation of a single-layer solid FDCF further increases these advantages. This is because a single-layer solid FDCF typically provides more flexibility than a multitude of single-layers stacked together as in a multiple-layer solid FDCF. As such, the single-layer solid FDCF will be allowed to flex even more into the air gap; thereby, further decoupling the aforementioned stresses.

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In contrast, primary reference *Frankeny* et al. merely discloses plated or filled vias extending vertically (not laterally) through the body 4 of interposer 3. (See Fig. 6 at positions 11, 14, 18, and 20) In fact, *Frankeny* et al. explicitly states that “FIGS. 3 and 4 show that the plated through holes 6 pass straight through dielectric body 4 of interposer 3.” (See column 4, lines 12-14) It is true that *Frankeny* et al. discloses a conductor 16 that runs laterally within body 4 of interposer 3, which may be either a single-layer or multiple-layer interposer, however *Frankeny* discloses that it is only “common to” the electrical connections created at locations 13 and 14. (See column 4, lines 56-63) That is, conductor 16 is merely common with the electrical connections, possibly to provide ground, power, or signal feeds into the electrical connections. *Frankeny* et al. does not teach or suggest that conductor 16 structurally connects the electrical connection (e.g., the not numerically referenced pads) created at location 13 with that created at location 14. Rather, it is the vertical straight through plated via at location 14 that structurally connects them. Similarly, secondary references *Ohshima* et al., *Akagawa* et al., *Mizuno* et al., and *Wang* et al. also fail to teach or suggest the claimed single-layer solid FDCF having the two landings connected via the routing conductor, which extends laterally within the single-layer solid FDCF.

Although the Examiner cited secondary reference *Ohshima* et al. as teaching the use of a thin film/solid multilayered wiring board substrate (MLBS)/dielectric circuit substrate where an outer and inner landings are connected within the MLBS via a routing conductor extending vertically and laterally within the MLBS, there is no fairly reasonable suggestion or motivation to combine *Ohshima* et al. with *Frankeny* et al. to obtain the routing conductor as claimed. This is because, given the context for which the routing conductor of *Ohshima* et al. was disclosed, *Ohshima* et al. merely teaches a routing conductor extending laterally within a multilayered substrate such as the MLBS. (See column 5, lines 15-17; column 6, lines 31-34) Furthermore, as is conventionally practiced, by increasing the layers in the package substrate (e.g., MLBS of *Ohshima* et al.), package stress can be better absorbed by the package substrate. Conversely, by decreasing the layers in the package substrate, package stress will be absorbed less by the package substrate. Therefore, there is no fairly reasonable suggestion or motivation to combine the routing conductor of *Ohshima* et al. with a single-layer substrate.

It is important to note that despite what is conventionally practiced, the single-layer solid flexible circuit film of the present invention is able to effectively absorb the package stress. This is because of the flexibility introduced by a single-layer solid FDCF in combination with the air gap is able to decouple the stress that might otherwise be transferred in a rigid underfill layer or

semi-rigid interposer layer located between the contact bumps and the die. As a result, a highly compliant interconnection between the die and another substrate can be realized.

In addition, the single-layer solid FDCF of the present invention allows for a thinner construction in producing smaller overall integrated circuit packages. For example, the single-layer solid FDCF of the present invention can be fabricated with thicknesses on the order of about 10,000 angstroms to 200,000 angstroms. (See page 14, lines 31-32) A multilayered substrate would obviously require a larger thickness as compared to a single-layer substrate. In view of the above, it is respectfully submitted that *Frankeny* et al., *Ohshima* et al., *Akagawa* et al., *Mizuno* et al. or *Wang* et al., alone or in combination, do not teach or suggest claims 1 and 15. Furthermore, there is no suggestion or motivation to combine the references to obtain claims 1 and 15. Therefore, it is submitted that claims 1 and 15 are patentable over the cited references.

Claims 2-3, 5-7, 16-17, 19-22, 25, 26, and 29-34 each depend either directly or indirectly from independent claims 1 and 15 and are therefore respectfully submitted to be patentable over the art of record for at least the reasons set forth above with respect to the independent claims 1 and 15. Additionally, these dependent claims require additional elements that when taken in the context of the claimed invention as a whole, further patentably distinguishes the art of record.

SUMMARY

It is respectfully submitted that all pending claims are allowable and that this case is now in condition for allowance. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any additional fees are due in connection with the filing of this Amendment, the Commissioner is authorized to deduct such fees from the undersigned's Deposit Account No. 500388 (Order No. NSC1P181).

Respectfully submitted,
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